

Chapter 7: Key Messages

- There is much that individuals can do to promote their own bone health, beginning in childhood and continuing into old age. These activities contribute not only to bone health, but to overall health and vitality.
- Since many nutrients are important for bone health, it is important to eat a well-balanced diet containing a variety of foods, including grains, fruits and vegetables, nonfat or low-fat dairy products or other calcium-rich foods, and meat or beans each day.
- Most Americans do not consume recommended levels of calcium, but reaching these levels is a feasible goal. Approximately three 8-ounce glasses of low-fat milk each day, combined with the calcium from the rest of a normal diet, is enough to meet the recommended daily requirements for most individuals. Foods fortified with calcium and calcium supplements can assist those who do not consume an adequate amount of calcium-rich foods.
- For many, especially elderly individuals, getting enough vitamin D from sunshine is not practical. These individuals should look to boost their vitamin D levels through diet. Vitamin D is also available in supplements for those unable to get enough through sunshine and diet.
- In addition to meeting recommended guidelines for physical activity (at least 30 minutes a day for adults and 60 minutes for children), specific strength- and weight-bearing activities are critical to building and maintaining bone mass throughout life.
- Individuals should see a health care provider if they have a medical condition or use medications that can affect the skeleton. Women should also see their health care provider if menstrual periods stop for 3 months.

Chapter 7

LIFESTYLE APPROACHES TO PROMOTE BONE HEALTH

As the evidence presented in the previous chapter makes clear, there is much that individuals can do to promote their own bone health throughout life. This chapter outlines recommendations for diet, physical activity, and other lifestyle practices that can help to achieve that goal. Moreover, the activities and practices suggested in this chapter contribute not only to bone health, but to overall health and vitality. In fact, bone-specific recommendations fit well within an overall program of good nutrition and physical activity that should be followed in order to prevent the onset of many of the major chronic diseases affecting Americans.

Nutrition

Since many nutrients are important for bone health, it is important to eat a well-balanced diet containing a variety of foods. Following the Dietary Guidelines for Americans (USDA 2000, USDHHS 2000) can help, although attention should be paid to serving sizes. These guidelines urge individuals to eat 6–11 servings of grain foods, 3–5 servings of vegetables, 2–4 servings of fruits, 2–3 servings of dairy or other calcium-rich foods, and 2–3 servings of meat or beans each day. The DASH (Dietary Approaches to Stop Hypertension) Eating Plan (USDHHS 2003), which follows these guidelines, is an ex-

ample of a well-balanced diet that can be good for bone and heart health, although bone outcomes from DASH have not been specifically tested. The DASH Eating Plan emphasizes fruits, vegetables, low-fat or fat-free dairy foods, whole grains, fish, poultry, and nuts, making it rich in calcium, magnesium, protein, and potassium while also being low in fat, cholesterol, and sodium. For more information about the Dietary Guidelines and the DASH Eating Plan, refer to Appendix C, Resources and Related Links.

Calcium

The Food and Nutrition Board (FNB) of the Institute of Medicine updated recommended intakes for several nutrients important to the skeleton in 1997, including calcium (IOM 1997). Recommended amounts of calcium, which are shown in Table 7-1, differ by age. These recommendations are meant for healthy people. Those with osteoporosis or other chronic conditions may need more calcium, but unfortunately the calcium requirements for individuals with this disease have not yet been clearly identified (Heaney and Weaver 2003). The highest amount (1,300 mg per day) is recommended for children and adolescents ages 9–18, a period when bones are growing rapidly. Pregnant or lactating women are advised to consume an age-appropriate

Table 7-1. Adequate Intakes (AI) or Recommended Dietary Allowances (RDA) and Tolerable Upper Intake Levels (UL) for Calcium, Vitamin D, Phosphorus, and Magnesium by Life-Stage Group for United States and Canada

| Life-stage group | Calcium (mg/day) | | Vitamin D (IU/day) | | Phosphorus (mg/day) | | Magnesium (mg/day) | | |
|-------------------|------------------|------|--------------------|------|---------------------|------|--------------------|--------|-----|
| | AI | UL | AI | UL | RDA | UL | RDA | | UL† |
| | | | | | | | Male | Female | |
| 0–6 months | 210 | ND* | 200 | 1000 | 100 | ND* | 30 | 30 | ND* |
| 7–12 months | 270 | ND* | 200 | 1000 | 275 | ND* | 75 | 75 | ND* |
| 1–3 years | 500 | 2500 | 200 | 2000 | 460 | 3000 | 80 | 80 | 65 |
| 4–8 years | 800 | 2500 | 200 | 2000 | 500 | 3000 | 130 | 130 | 110 |
| 9–13 years | 1300 | 2500 | 200 | 2000 | 1250 | 4000 | 240 | 240 | 350 |
| 14–18 years | 1300 | 2500 | 200 | 2000 | 1250 | 4000 | 410 | 360 | 350 |
| 19–30 years | 1000 | 2500 | 200 | 2000 | 700 | 4000 | 400 | 310 | 350 |
| 31–50 years | 1000 | 2500 | 200 | 2000 | 700 | 4000 | 420 | 320 | 350 |
| 51–70 years | 1200 | 2500 | 400 | 2000 | 700 | 4000 | 420 | 320 | 350 |
| >70 years | 1200 | 2500 | 600 | 2000 | 700 | 3000 | 420 | 320 | 350 |
| Pregnancy: | | | | | | | | | |
| <18 years | 1300 | 2500 | 200 | 2000 | 1250 | 3500 | | 400 | 350 |
| 19–30 years | 1000 | 2500 | 200 | 2000 | 700 | 3500 | | 350 | 350 |
| 31–50 years | 1000 | 2500 | 200 | 2000 | 700 | 3500 | | 360 | 350 |
| Lactation: | | | | | | | | | |
| <18 years | 1300 | 2500 | 200 | 2000 | 1250 | 4000 | | 360 | 350 |
| 19–30 years | 1000 | 2500 | 200 | 2000 | 700 | 4000 | | 310 | 350 |
| 31–50 years | 1000 | 2500 | 200 | 2000 | 700 | 4000 | | 320 | 350 |

*ND Not determinable

†Represents intake from pharmacological agents only, does not include intake from food and water.

Source: IOM 1997. Reprinted with permission from the National Academy of Sciences courtesy of the National Academies Press, Washington, D.C.

amount of calcium, as shown in Table 7-1. The Institute of Medicine also defined a safe upper limit of 2,500 mg per day for calcium (IOM 1997). Intakes above 2,500 mg per day may increase the risk of adverse effects in susceptible individuals.

Americans obtain most of their calcium from dairy products. In fact, approximately three 8-ounce glasses of milk each day, combined with

the calcium from the rest of a normal diet, is enough to meet the recommended daily requirements for most adults. Lowfat or nonfat versions of dairy products are good choices because they have the full amount of calcium, but help to avoid eating too much fat. Foods that have been fortified with calcium are also good sources of the nutrient. There are many foods that serve as

Table 7–2. Selected Food Sources of Calcium

| Food | Calcium (mg) | % DV* |
|--|--------------|----------|
| Sardines, canned in oil, with bones, 3 oz. | 324 | 32% |
| Cheddar cheese, 1½ oz. shredded | 306 | 31% |
| Milk, nonfat, 8 fl oz. | 302 | 30% |
| Yogurt, plain, low fat, 8 oz | 300 | 30% |
| Milk, reduced fat (2% milk fat), no solids, 8 fl oz. | 297 | 30% |
| Milk, whole (3.25% milk fat), 8 fl oz. | 291 | 29% |
| Milk, buttermilk, 8 fl oz. | 285 | 29% |
| Milk, lactose reduced, 8 fl oz. (content varies slightly according to fat content; average = 300 mg) | 285–302 | 29–30% |
| Cottage cheese, 1% milk fat, 2 cups unpacked | 276 | 28% |
| Mozzarella, part skim 1½ oz. | 275 | 28% |
| Tofu, firm, w/calcium, ½ cup† | 204 | 20% |
| Orange juice, calcium fortified, 6 fl oz. | 200–260 | 20–26% |
| Salmon, pink, canned, solids with bone, 3 oz. | 181 | 18% |
| Pudding, chocolate, instant, made with w/ 2% milk, ½ cup | 153 | 15% |
| Tofu, soft, w/calcium, ½ cup† | 138 | 14% |
| Breakfast drink, orange flavor, powder prepared with water, 8 fl oz. | 133 | 13% |
| Frozen yogurt, vanilla, soft serve, ½ cup | 103 | 10% |
| Ready to eat cereal, calcium fortified, 1 cup | 100–1000 | 10%–100% |
| Turnip greens, boiled, ½ cup | 99 | 10% |
| Kale, raw, 1 cup | 90 | 9% |
| Kale, cooked, 1 cup | 94 | 9% |
| Ice Cream, vanilla, ½ cup | 85 | 8.5% |
| Soy beverage, calcium fortified, 8 fl oz. | 80–500 | 8–50% |
| Chinese cabbage, raw, 1 cup | 74 | 7% |
| Tortilla, corn, ready to bake/fry, 1 medium | 42 | 4% |
| Tortilla, flour, ready to bake/fry, one 6” diameter | 37 | 4% |
| Sour cream, reduced fat, cultured, 2 tbsp | 32 | 3% |
| Bread, white, 1 oz. | 31 | 3% |
| Broccoli, raw, ½ cup | 21 | 2% |
| Bread, whole wheat, 1 slice | 20 | 2% |
| Cheese, cream, regular, 1 Tbsp | 12 | 1% |

Source: USDA 2002, Heaney et al. 2000.

*DV=Daily Value

†Calcium values are only for tofu processed with a calcium salt. Tofu processed with a non-calcium salt will not contain significant amounts of calcium.

Note: Daily Values (DV) were developed to help consumers determine if a typical serving of a food contains a lot or a little of a specific nutrient. The DV for calcium is based on 1000 mg. The percent DV (% DV) listed on the nutrition facts panel of food labels tells you what percentages of the DV are provided in one serving. For instance, if you consumed a food that contained 300 mg of calcium, the DV would be 30% for calcium on the food label.

A food providing 5% of the DV or less is a low source while a food that provides 10–19% of the DV is a good source and a food that provides 20% of the DV or more is an excellent source for a nutrient. For foods not listed in this table, see the United States Department of Agriculture’s Nutrient Database Web site: www.nal.usda.gov/fnic/cgi-bin/nut_search.pl

Table 7-3. Calcium and Lactose in Common Foods

| | Calcium Content | Lactose Content |
|--|-----------------|-----------------|
| Vegetables, Fruit, Seafood | | |
| Calcium-fortified orange juice, 1 cup | 308–344 mg | 0 |
| Sardines, with edible bones, 3 oz. | 270 mg | 0 |
| Salmon, canned, with edible bones, 3 oz. | 205 mg | 0 |
| Soymilk, fortified, 1 cup | 200 mg | 0 |
| Broccoli (raw), 1 cup | 90 mg | 0 |
| Orange, 1 medium | 50 mg | 0 |
| Pinto beans, ½ cup | 40 mg | 0 |
| Tuna, canned, 3 oz. | 10 mg | 0 |
| Lettuce greens, ½ cup | 10 mg | 0 |
| Dairy Products | | |
| Yogurt, plain, low-fat, 1 cup | 415 mg | 5 g |
| Milk, reduced fat, 1 cup | 295 mg | 11 g |
| Swiss cheese, 1 oz. | 270 mg | 1 g |
| Ice cream, ½ cup | 85 mg | 6 g |
| Cottage cheese, ½ cup | 75 mg | 2–3 g |

Source: NIDDIC 2004.

good sources of calcium, including fortified cereal, nonfat milk, and calcium-fortified orange juice from frozen concentrate (Keller et al. 2002). Vegetables also contain calcium, but the amount of calcium absorbed from these sources varies; some, like broccoli and kale, contain calcium that is well absorbed, while others, such as spinach, do not (Weaver et al. 1999). It would be impractical for most people to eat enough vegetables or other low-calcium foods to meet recommended levels if these were the only sources of calcium in the diet. To assist in planning a diet containing adequate levels of calcium, Table 7-2 provides a list of selected food sources of calcium, along with the percent daily value that they contain. These percentages indicate whether a serv-

ing of the food contains a high (20 percent or more of the percent daily value) or a low (5 percent or less) amount of a specific nutrient—in this case, calcium. Most individuals can design a diet that is appealing to them (based on their preferences) while also meeting their nutrient needs.

Many individuals, especially non-Whites, suffer from lactose intolerance. These individuals may avoid dairy products, which can result in a low calcium intake unless other good sources of calcium are consumed. Those with lactose intolerance may develop the capability to digest lactose if they slowly build up milk intake over a period of days or weeks so that they develop an intestinal flora capable of digesting milk's lactose (Suarez et al. 1997). Many lactose-intolerant

A Guide to Calculate Calcium Intake

As shown in Figure 6-4 of Chapter 6, most Americans above age 9 on average do not consume recommended levels of calcium. The following guide allows an adult to compare a rough estimate of his or her intake of calcium to the recommended amounts:

- Start by writing down the following amount:
 - ~ 290 if you are a female, regardless of age, or male age 60 or older
 - ~ 370 if you are a male under age 60

This is the average amount of calcium that most people eat from non-calcium rich food sources (Cook and Friday 2003, Wright et al. 2003, Weinberg et al. 2004).

- Add 300 mg for each 8-ounce serving of milk or the equivalent serving of other calcium-rich foods (e.g., yogurt, cheese).
- For those taking a calcium supplement or a multi-vitamin containing calcium, add the amount of calcium from that source:
 - ~ Check the supplement label for the amount of calcium per supplement dose.
 - ~ Multiply the amount per supplement dose times the number of doses taken each day.
 - ~ Add the amount from supplements to the base amount and the amount from calcium-rich foods.
- Compare this rough estimate of total calcium intake to the recommended levels shown in Table 7-1. Individuals should try to meet their recommended level of calcium on most days.
- A useful calcium calculator for children can be found at: <http://www.cdc.gov/powerfulbones/parents/toolbox/calculator.html>.

Figure 7-1. How To Use the Nutrition Facts Panel on Food Labels for Calcium

| Nutrition Facts | | |
|-----------------------------|---------------|-----------------------|
| Serving Size 1 cup (236 ml) | | |
| Servings Per Container 1 | | |
| Amount Per Serving | | |
| Calories | 80 | Calories from Fat 0 |
| % Daily Value* | | |
| Total Fat | 0g | 0% |
| Saturated Fat | 0g | 0% |
| Trans Fat | 0g | |
| Cholesterol | Less than 5mg | 0% |
| Sodium | 120mg | 5% |
| Total Carbohydrate | 11g | 4% |
| Dietary Fiber | 0g | 0% |
| Sugars | 11g | |
| Protein | 9g | 17% |
| Vitamin A | 10% | Vitamin C 4% |
| Calcium | 30% | Iron 0% Vitamin D 25% |

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

30% = 300 mg

Note: The Nutrition Facts panel on food labels can help individuals choose foods high in calcium. To convert the % Daily Value (DV) for calcium into milligrams (mg) multiply by 10 or add a 0. As an example, a container of yogurt might list 30% DV for calcium. To convert this to milligrams, multiply by 10 or add a 0, which equals 300 mg of calcium for the serving size of 1 cup of yogurt. A food with 20% DV or more contributes a lot of calcium to the daily total, while one with 5% DV or less contributes a little.

Source: FDA 2003.

Tips for Those With Lactose Intolerance

- Choose dairy and other calcium-rich foods with lower amounts of lactose; a list of the amount of calcium and lactose in common foods is shown in Table 7-3:
 - ~ Yogurt with live active cultures (which provide bacterial lactase that digests the lactose).
 - ~ Hard cheeses like cheddar, Colby, Swiss, and Parmesan (the production process for these cheeses breaks down the lactose).
 - ~ Lactose-free or lactose-reduced products, including milk without lactose.
- Gradually increase the amount of lactose-containing foods consumed.
- Consume non-dairy products that contain high levels of calcium, such as fortified soy beverage or fortified cereal or orange juice.

(Jarvis and Miller 2002)

individuals can tolerate up to one cup of milk twice a day if it is consumed with food (McBean and Miller 1998). In addition, some other calcium-rich dairy products such as cheese and yogurt are usually well tolerated by lactose-intolerant people. Finally, there are a number of calcium-rich foods that do not contain lactose, including lactose-free milk, fortified soy beverage, and fortified juice and cereal. Some tips for those with lactose intolerance are shown in the box below.

The Institute of Medicine recommends that nutrients be obtained from food when possible because they provide a package of nutrients that are good for other tissues besides bones. How-

ever, fortified foods and supplements can assist those individuals who do not consume an adequate amount of dairy products or other naturally calcium-rich foods to meet recommended levels of calcium intake. Those who take supplements or consume fortified foods should note that: a) all major forms of calcium (e.g., carbonate, citrate) are absorbed well when taken with meals; b) calcium from supplements or fortified foods is best taken in several small doses (no more than 500–600 mg at one time) (Heaney 1975) throughout the day for better absorption; and c) supplements may differ in their absorbability due to manufacturing practices (IOM 1997). One need not choose the most expensive products on the market, as the cost of supplements of comparable quality can vary fivefold (Heaney et al. 2001). In a recent evaluation of calcium sources, calcium carbonate supplements were found to be the least expensive supplemental source of calcium. Since virtually all calcium sources—food or supplement—reduce the absorption of iron, calcium and iron supplements should be taken at different times.

Vitamin D

The current recommended intakes of vitamin D are given in Table 7-1. Most individuals need 200 IU per day, although these recommendations are raised to 400 IU per day in those age 50–70, and to 600 IU per day in those over age 70. There are two sources of vitamin D: sunlight and dietary intake.

As discussed in Chapter 6, vitamin D can be made in the skin by being exposed to sunlight. For some individuals, particularly children and others who get enough exposure during warmer months, the sun can provide adequate levels of vitamin D throughout the entire year. For many, however, it is not practical to get adequate levels of vitamin D from exposure to sunshine. These individuals should instead look to boost their

vitamin D levels through diet. This is especially true for elderly individuals who have higher vitamin D needs and who may have difficulty getting outside everyday. People with dark skin and those who live in areas with heavy air pollution may also find it more practical to obtain most or all of their vitamin D from diet, since they need longer periods of sun exposure to get adequate levels of vitamin D. Table 7-4 gives the vitamin D content of several foods, although the most common source is fortified milk. One cup of fortified milk contains 100 IU vitamin D, half of the recommended intake for individuals under age 50. Since vitamin D-fortified milk is not used when making cheese, ice cream, or most yogurts, many other dairy foods are not good sources of vitamin D. Other good dietary sources of vitamin D include fatty fish and vitamin D-fortified orange juice. The best way to know whether a dairy food contains vitamin D is to check the nutrition label.

Vitamin D is also available in dietary supplements. While few supplements contain vitamin D alone, many calcium supplements also con-

tain vitamin D. Multivitamin supplements contain up to 400 IU of vitamin D. The amount of vitamin D in a single dose of many calcium and multivitamin supplements may not be sufficient to meet the recommended levels, especially for people over age 70 who need 600 IU per day. To make sure that the recommended amount of vitamin D is consumed as shown in Table 7-1, check the nutrition label on the supplement for the amount of vitamin D per dose, and, if necessary, supplement vitamin D intake through other sources. However, because vitamin D can have negative effects if taken in very high doses, it is also important to avoid consuming more vitamin D than the tolerable upper level of 2,000 IU per day. Larger doses can initially be given to patients who are deficient as a means of replenishing the stores of vitamin D in the body.

Other Nutrients Important to Bone

As shown in Table 7-1, the Institute of Medicine recently provided recommended intakes for other bone-related nutrients, including phosphorus and magnesium (IOM 1997). Most Americans consume adequate quantities of phospho-

Table 7-4. Dietary Sources of Vitamin D

| | Serving Size | Vitamin D (IU) |
|--------------------|--------------|----------------|
| Milk | 1 cup | 98 |
| Baked herring | 3 oz. | 1,775 |
| Baked salmon | 3 oz. | 238 |
| Canned tuna | 3 oz. | 136 |
| Sardines | 1 oz. | 77 |
| Raisin bran cereal | ¾ cup | 42 |
| Pork sausage | 1 oz | 31 |
| Egg yolk | 1 | 25 |

Source: USDA 2002.

Table 7–5. Other Nutrients and Bone Health at a Glance

| Other Nutrients Affecting Bone | What Is the Effect on Bone? | How Much Is Needed?* | What Are the Dietary Sources? | Special Considerations |
|---|---|--|--|---|
| Potentially Beneficial Effects on Bone | | | | |
| Boron | May enhance calcium absorption and estrogen metabolism. | Not applicable. | Raw avocado, nuts, peanut butter, bottled prune juice. | |
| Copper | Copper helps certain enzymes and local regulators function properly so that we can form the optimal bone matrix or structure for bone strength. | RDA is 900 µg for men and women over age 30. Daily intakes over 10,000 µg are not recommended. | Organ meats, seafood, nuts, seeds, wheat bran, cereals, whole grain products, cocoa products. | Calcium supplementation may result in lower levels of copper. |
| Fluoride | Fluoride stimulates the formation of new bone. Necessary for skeletal and dental development. | RDA is 4 mg for men over age 30 and 3 mg for women over age 30. Daily intakes over 10 mg are not recommended. | Fluoridated water, teas, marine fish, fluoridated dental products. | |
| Iron | Iron helps certain enzymes and local regulators function properly so that we can form the optimal bone matrix or structure for bone strength. | RDA is 8 mg for men over the age of 19. The RDA for women is 18 mg between the ages of 19 and 50 and 8 mg over age 50. Daily intakes over 45 mg are not recommended. | <i>Non-heme sources</i> include fruits, vegetables and fortified bread and grain products such as cereal. <i>Heme sources</i> include meat and poultry. | |
| Isoflavones | Isoflavones have been shown to have a protective effect on bone in animal studies. Evidence in humans, however, is conflicting. | Not applicable. | Primarily found in soybeans and soy products, chickpeas and other legumes. | Ipriflavone, a synthetic isoflavone, has been linked to a reduction in lymphocytes, a type of white blood cell that fights infection. |
| Magnesium | 60% of the magnesium in our bodies is found in our bones in combination with calcium and phosphorus. Magnesium appears to enhance our bone quality. Studies suggest that it may improve bone mineral density, and not getting enough may interfere with our ability to process calcium. | RDA is 420 mg for men over 30 and 320 mg for women over 30. Daily intakes over 350 mg are not recommended | Good sources include green leafy vegetables such as spinach, potatoes, nuts, seeds, whole grains including bran, wheat, oats, and chocolate. Smaller amounts are found in many foods including bananas, broccoli, raisins and shrimp. Also found in magnesium-containing laxatives and antacids. | Magnesium deficiency is rare in US adults. Magnesium supplements are not recommended for most people. |

*Recommended Dietary Allowance (RDA)

Source: NIH ORBD~NRC 2004.

Table 7–5. Other Nutrients and Bone Health at a Glance

| Other Nutrients Affecting Bone | What Is the Effect on Bone? | How Much Is Needed?* | What Are the Dietary Sources? | Special Considerations |
|---|---|---|---|---|
| Potentially Beneficial Effects on Bone | | | | |
| Manganese | Manganese helps certain enzymes and local regulators function properly so that we can form the optimal bone matrix or structure for bone strength. | RDA is 2.3 mg for men over age 30 and 1.8 mg for women over age 30. Daily intakes over 11 mg are not recommended. | Nuts, legumes, tea, whole grains and drinking water. | Manganese supplements may not be a good choice for everyone, including people already consuming high levels of manganese from diets high in plant foods and people with liver disease who are especially susceptible to the adverse effects of excess manganese intake. |
| Phosphorus | Phosphorus is a component of every cell in our bodies and supports building bone and other tissue during growth. About 85% of the phosphorus in our bodies is found in our bones. In fact, phosphate, a form of phosphorus, makes up more than half of our bone mineral mass. | RDA is 700 mg for men and women over age 30. Daily intakes over 4,000 mg for adults up to age 70 and over 3,000 mg after age 70 are not recommended. | Milk, yogurt, ice cream, cheese, peas, meat, eggs, some cereals, breads, cola soft drinks and many processed foods. | |
| Potassium | | There is no RDA established for potassium. Scientists recommend a daily intake between 1,600 mg and 3,500 mg. | Milk, yogurt, chicken, turkey, fish, many fruits such as bananas, raisins and cantaloupe, and many vegetables such as celery, carrots, potatoes and tomatoes. | |
| Protein | Proteins are our bodies' building blocks. We use protein to build tissue during growth and to repair and replace tissue throughout life. We also need protein to help heal fractures and to make sure our immune system is functioning properly. | RDA is 56 g for adult men and 46 g for adult women. Nutritionists recommend that 10% to 35% of our calories come from protein. (The rest come primarily from carbohydrates and fats.) | <i>Complete protein comes from animal sources</i> including meat, poultry, fish, eggs, milk, cheese, yogurt. <i>Incomplete protein comes from plant sources</i> including legumes, grains, nuts, seeds and vegetables. | Getting enough protein is particularly important for elderly people. Studies show that elderly people who have not been getting enough protein and who break their hip are more likely to suffer poor medical outcomes. |

*Recommended Dietary Allowance (RDA)

Source: NIH ORBD~NRC 2004.

Table 7-5. Other Nutrients and Bone Health at a Glance

| Other Nutrients Affecting Bone | What Is the Effect on Bone? | How Much Is Needed?* | What Are the Dietary Sources? | Special Considerations |
|---|---|---|---|---|
| Potentially Beneficial Effects on Bone | | | | |
| Vitamin C | Vitamin C helps certain enzymes and local regulators function properly so that we can form the optimal bone matrix or structure for bone strength. | RDA is 90 mg for men over age 30 and 75 mg for women over age 30. Daily intakes over 2,000 mg are not recommended. | Citrus fruits, tomatoes and tomato juice, potatoes, Brussels sprouts, cauliflower, broccoli, strawberries, cabbage and spinach. | People who smoke need 35 mg more vitamin C than the RDA. People who are regularly exposed to second-hand smoke also may need extra vitamin C. |
| Vitamin K | Vitamin K helps certain enzymes and local regulators function properly so that we can form the optimal bone matrix or structure for bone strength. | RDA is 120 units for men over age 30 and 90 units for women over age 30. No maximum safe intake has been established for vitamin K. | Green vegetables including collards, spinach, salad greens and broccoli, Brussels sprouts, cabbage, plant oils and margarine. | Patients on anticoagulant medication should monitor their vitamin K intake. |
| Zinc | Zinc helps certain enzymes and local regulators function properly which in turn helps our bodies form the optimal bone matrix or structure for bone strength. | RDA is 11 mg for boys and men over age 19 and 8 mg for girls and women over age 19. Daily intakes over 40 mg are not recommended. | Red meat, poultry, fortified breakfast cereal, some seafood, whole grains, dry beans and nuts. | Nutritionists recommend that vegetarians double the RDA for themselves, because zinc is harder to absorb on a vegetarian diet. Calcium supplementation may reduce the absorption of zinc. |

*Recommended Dietary Allowance (RDA)

Table 7–5. Other Nutrients and Bone Health at a Glance

| Other Nutrients Affecting Bone | What Is the Effect on Bone? | How Much Is Needed?* | What Are the Dietary Sources? | Special Considerations |
|--|--|--|--|---|
| Potentially Adverse Effects on Bone | | | | |
| Caffeine | Studies suggest that caffeine may interfere with calcium absorption. However, this effect can be neutralized in the presence of adequate dietary calcium. | Not applicable | Coffee, tea, some soft drinks, some over the counter medications. | |
| Fiber | Fiber has a minor negative impact on calcium absorption. | Men ages 31 to 50 need 38 grams per day and after 50 need 30 grams per day. Women ages 31–50 need 25 gm per day and after 50 need 21 gm per day. | Includes dietary fiber naturally present in grains (oats, wheat or unmilled rice) and functional fiber from plants and animals shown to be of benefit to health. | |
| Oxalates | When oxalates and calcium are found in the same food, oxalates combine with the calcium, preventing us from absorbing the calcium. | Not applicable | Spinach. Other oxalate-rich foods include rhubarb and sweet potatoes, but since these foods do not contain calcium, the oxalates have no effect on calcium absorption. | Oxalates do not interfere with the absorption of calcium in <i>other</i> foods eaten with the oxalate-containing foods. |
| Phosphorus | Phosphorus is necessary for healthy bones (see above), but some people are concerned that there may be too much in our diet, especially since phosphorus is a component of cola beverages and many processed foods. Some studies suggest that excess amounts of phosphorus may interfere with calcium absorption. The good news is that we can offset the loss by getting adequate amounts of calcium in our diet. | RDA is 700 mg for men and women over age 30. Daily intakes over 4,000 mg for adults up to age 70 and over 3,000 mg after age 70 are not recommended. | Milk, yogurt, ice cream, cheese, peas, meat, eggs, some cereals, breads, cola soft drinks and many processed foods. | Possible negative effects of soft drinks on bone may be due primarily to the replacement of calcium-rich milk with soft drinks, especially by children and teenagers at a time when they need extra calcium to optimize their peak bone mass. |

*Recommended Dietary Allowance (RDA)

Source: NIH ORBD~NRC 2004.

Table 7-5. Other Nutrients and Bone Health at a Glance

| Other Nutrients Affecting Bone | What Is the Effect on Bone? | How Much Is Needed?* | What Are the Dietary Sources? | Special Considerations |
|--|--|---|---|------------------------|
| Potentially Adverse Effects on Bone | | | | |
| Protein | Protein is essential for good health (see above). However, when we get too much protein, our bodies convert the extra protein into calories for energy, producing a chemical called sulfate in the process. Sulfate causes us to lose some calcium, but these are relatively small losses that we can offset by getting adequate amounts of calcium in our diet. | RDA is 56 g for adult men and 46 g for adult women. It is recommended that 10% to 35% of calories come from protein. (The rest come primarily from carbohydrates and fats.) | <i>Complete protein comes from animal sources</i> including meat, poultry, fish, eggs, milk, cheese, yogurt. <i>Incomplete protein comes from plant sources</i> including legumes, grains, nuts, seeds and vegetables. | |
| Sodium | Sodium affects the balance of calcium in our bodies by increasing the amount we excrete in urine and perspiration. The loss of calcium can be significant, but we can replace the lost calcium by making sure we get adequate amounts of calcium in our diet. | The NIH recommends restricting daily sodium intake to less than 2,400 milligrams (equal to about 1 teaspoon of table salt). | Sodium combined with chloride is common table salt. Many processed foods are high in salt. | |
| Vitamin A | Vitamin A plays an important role in bone growth but excessive amounts of the retinol form of vitamin A may increase the breakdown of our bones and interfere with vitamin D, which we need to help us absorb calcium. The beta carotene form of vitamin A does not appear to cause these problems. | RDAs are 3000 IU for men and 2330 IU for women. Daily intakes over 10,000 IU of the retinol form of vitamin A are not recommended. | <i>Retinol sources</i> include animal-source foods such as liver, egg yolks, cheese, milk. Dietary supplements and some acne preparations also contain retinol. <i>Beta carotene sources</i> include plant-source foods, such as dark orange and green vegetables including carrots, sweet potatoes, and spinach as well as cantaloupe and kale. | |

*Recommended Dietary Allowance (RDA)

Source: NIH ORBD~NRC 2004.

rus through their regular intake of meats, cereals, milk, and processed foods. While some beverages such as soft drinks also contain phosphorus, they are not a preferred source of phosphorus because they may displace calcium-rich beverages like milk (Whiting et al. 2001).

Magnesium intakes may be suboptimal in those who do not eat enough green leafy vegetables, whole grains, nuts, and dairy products. Fortunately, most diets contain adequate levels of other bone-related micronutrients, such as vitamins K and C, copper, manganese, zinc, and iron, to promote bone health.

Some dietary components may potentially have negative effects on bone health, especially if calcium intakes are not adequate. For example, high levels of sodium or caffeine intake can increase calcium excretion in the urine. The effects of these factors can be overcome by increasing the amount of calcium in the diet (Fitzpatrick and Heaney 2003). Studies have linked excessive amounts of phosphorus to altered calcium metabolism, but it appears that the typical level of phosphorus consumed by most individuals in the United States should not negatively affect bone health (IOM 1997). Excessive amounts of preformed vitamin A (e.g., retinol) can also have negative effects on bone, so individuals should not consume more than the recommended dietary allowance for this vitamin (IOM 2000). The vitamin A precursor (beta carotene) found in many fruits and vegetables does not have negative effects on bone, however.

Table 7-5 provides additional information on other nutrients that affect bone, their recommended dietary allowances, and common dietary sources of these nutrients.

Physical Activity

The foundation of a good physical activity regimen involves at least 30 minutes (adults) or

60 minutes (children) of moderate physical activity every day. This regimen can and should involve a variety of activities. Some can be routine activities like walking or gardening. Others may occur more infrequently and differ from day to day and week to week, such as dancing, aerobic classes, biking, swimming, tennis, golf, or hiking. However, it is clear from the evidence presented in Chapter 6 that physical activity to specifically benefit bone health should involve loading (stressing) the skeleton. As a result, weight-bearing activities such as walking should be included in an optimal physical activity regimen to benefit the musculoskeletal system. Moreover, the evidence suggests that the most beneficial physical activity regimens for bone health include strength-training or resistance-training activities. These activities place levels of loading on bone that are beyond those seen in everyday activities; examples include jumping for the lower limbs and weight lifting or resistance training for the lower and upper skeleton. Finally, while a focus on activities that build or maintain bone strength is appropriate and necessary, many older individuals will remain at high risk of fracture. For these individuals, balance training can provide the added benefit of helping to prevent potentially injurious falls.

As noted in Chapter 6, the evidence does not lead to a specific set of exercises or practices but rather a set of principles that can be applied and varied according to the age and current physical condition of an individual. Many of these principles have been reviewed by expert panels of the American College of Sports Medicine (ACSM) (Kraemer et al. 2002, ACSM 1998a, ACSM 1998b) and they lead to the following suggestions for the frequency, intensity, length, and type of physical activity regimens to benefit bone health for individuals of all ages:

- Since continued physical activity provides a positive stimulus for bone, muscle, and other aspects of health, a lifelong commitment to physical activity and exercise is critical.
- Ending a physical activity regimen will result in bone mass returning to the level that existed before the activity began. Since repetitive programs of physical activity may be discontinued due to lack of motivation or interest, variety and creativity are important if physical activity is to be continued over the long term.
- Physical activity will only affect bone at the skeletal sites that are stressed (or loaded) by the activity. In other words, physical activity programs do not necessarily benefit the whole skeleton, although any type of activity provides more benefit to bone than does no activity at all.
- For bone gain to occur, the stimulus must be greater than that which the bone usually experiences. Static loads applied continuously (such as standing) do not promote increased bone mass.
- Complete lack of activity, such as periods of immobility, causes bone loss. When it is not possible to avoid immobility (e.g., bed rest during sickness), even brief daily weight-bearing movements can help to reduce bone loss.
- General physical activity every day and some weight-bearing, strength-building, and balance-enhancing activities 2 or more times a week are generally effective for promoting bone health for most persons.
- Any activity that imparts impact (such as jumping or skipping) may increase bone mass more than will low- and moderate-intensity, endurance-type activities, such as brisk walking. However, endur-

ance activities may still play an important role in skeletal health by increasing muscle mass and strength, balance, and coordination, and they may also help prevent falls in the elderly. Endurance activity is also very important for other aspects of health, such as helping to prevent obesity, diabetes, or cardiovascular disease.

- Load-bearing physical activities such as jumping need not be engaged in for long periods of time to provide benefits to skeletal health. In fact, 5–10 minutes daily may suffice. Most adults should begin with weight-bearing exercise and gradually add some skipping and jumping activity. Longer periods (30–45 minutes) may be needed for weight training or walking/jogging. Those who have been inactive should work up to this amount of time gradually using a progressive program, e.g., start with shorter times and easier activities (light weights or walking) and then increase time or intensity slowly (by no more than 10 percent each week) in order to avoid injury.
- Physical activities that include a variety of loading patterns (such as strength training or aerobic classes) may promote increased bone mass more than do activities that involve normal or regular loading patterns (such as running).

These fundamental principles can be used to develop age-specific regimens, as outlined in the sections that follow.

Physical Activity for Children and Adolescents

For children over age 8 and adolescents, a bone-healthy program of physical activity could include the following:

- At least 60 minutes of moderate intensity, continuous activity on most days, prefer-

Table 7–6. Weight-Bearing Exercise for Kids and Teens

Exercise helps build bone and weight-bearing exercise is particularly helpful in this task. Weight-bearing exercise includes any activity in which your feet and legs carry your own weight. Here are some examples of weight-bearing exercise that can help you build strong bones:

- Walking
- Running
- Jumping
- Jumping rope
- Dancing
- Climbing stairs
- Jogging
- Aerobic dancing
- Hiking
- Inline skating/ice skating
- Racquet sports, such as tennis or racquetball
- Team sports such as soccer, basketball, field hockey, volleyball, and softball or baseball

Source: NICHD 2004.

ably daily. This level of activity can help achieve a healthy body weight and lower the risk of other diseases such as cardiovascular disease and diabetes (USDHHS 1996, USDA 2000, USDHHS 2000, IOM 2002).

- Inclusion of weight-bearing and short, intense impact activities such as basketball, gymnastics, and jumping as part of this regular activity program.
- Performance of weight-bearing activities that increase muscle strength, such as

running, hopping, or skipping. The best activities work all muscle groups. Examples include gymnastics, basketball, volleyball, bicycling, and soccer. Swimming, while highly beneficial to many aspects of health, is not a weight-bearing activity and thus does not contribute to increased bone mass.

Physical Activity for Adults

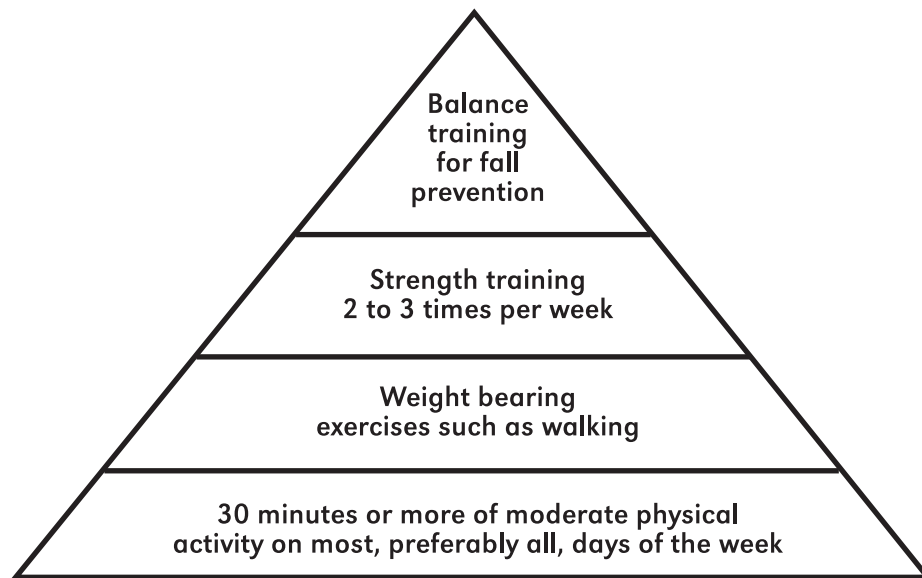
Adults should strive to get at least 30 minutes of physical activity on most days, preferably daily (USDHHS 1996, USDA 2000, USDHHS 2000, IOM 2002). As part of that regular physical activity program, the following can help enhance bone health:

- For those individuals who can tolerate impact activities, a simple, 10-minute program of physical activity that incorporates 50 3-inch (8-centimeter) jumps per day.
- A progressive program of weight training that uses all muscle groups, with the amount of weight lifted increased gradually over time.
- A jogging or stair-climbing program for those who cannot tolerate higher impact physical activity.
- Active recreational activities such as tennis, hiking, or basketball.

In addition, it is advisable for adults to try to find ways to add extra weight-bearing exercise into everyday activities. For example, consider parking farther away in the parking lot or taking the stairs instead of the elevator.

General recommendations for physical activity in adults are shown in the pyramid in Figure 7-2, with the base of the pyramid being 30 minutes or more of moderate physical activity on most, preferably all, days of the week. It is also recommended that weight-bearing exercises and strength and balance training be added as a

Figure 7–2. General Recommendations for Physical Activity in Adults



Source: Nelson 2002.

part of regular physical activity (Nelson 2002, Seguin and Nelson 2003). Lifestyle activities such as walking, gardening, and raking leaves can also be a valuable part of regular physical activity (USDHHS 1996).

It is important to begin any physical activity program slowly and to consider previous activity levels. Those who have been inactive should begin with 5–10 minutes of activity per day and a pre-exercise evaluation by a physician may be advised. Those who are more fit can increase physical activity levels to 20–30 minutes of moderate activity at a higher heart rate (60–85 percent of maximum heart rate). Generally, it is advisable to increase activity levels by no more than 10 percent each week to avoid injury. For example, those who begin with 15 minutes per day can progress to 17 minutes the second week, and so on.

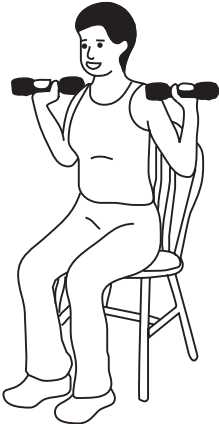
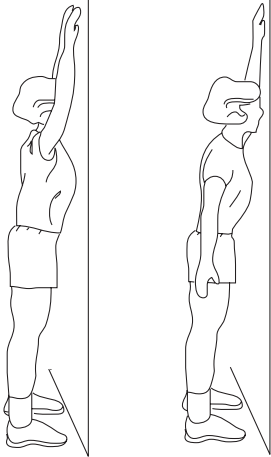
Finally, adults should consult a physician or physical therapist if orthopedic conditions like arthritis, functional limitations, or other medical conditions make these physical activity guidelines difficult or unsafe to follow.

Physical Activity for Older Adults

Most elderly individuals should strongly consider engaging in regular physical activity. Physical activity is the only single therapy that can simultaneously improve muscle mass, muscle strength, balance, and bone strength. As a result, it may decrease the risk of fractures, in part by reducing the risk of falling. In fact, fall-risk reduction may be the biggest benefit of physical activity for the elderly.

The following guidelines should be used to maximize the potential fall prevention benefits of physical activity in the elderly:

Figure 7–3. Examples of Strength Training Exercises

| Overhead Press | Wall Arch |
|--|---|
|  <ol style="list-style-type: none"> 1. Stand or sit in an armless chair with feet shoulder-width apart. With a dumbbell in each hand, raise your hands, palms facing forward, until the dumbbells are level with your shoulders and parallel to the floor. 2. To a count of two, slowly push the dumbbells up over your head until your arms are fully extended—but don't lock your elbows. 3. Pause. Then, to a count of four, slowly lower the dumbbells back to shoulder level, bringing your elbows down close to your sides. 4. Repeat ten times for one set. Rest for one to two minutes. Then complete a second set of ten repetitions. <p>Benefit: Strengthens muscles in the arms, upper back, and shoulders.</p> |  <ol style="list-style-type: none"> 1. Face a wall with your feet 6 inches from the wall and 6 inches apart. 2. Stretch your arms up to touch the wall while taking a deep breath in. 3. Concentrate on flattening your stomach. 4. Also, try reaching up with one arm while stretching down with the other. <p>Benefit: Strengthens stomach and back, stretches shoulders and calves.</p> |

Source: CDC 2004, NOF 2003.

- Physical activity needs to be of sufficient intensity to improve muscle strength, since poor muscle strength is a known risk factor for falls. Strength or resistance training is best for building muscle, but even aerobic endurance activity can yield some improvements in muscle strength.
- Improving balance can be an important component of any physical activity program designed to decrease falls. This program may include balance training exercises or a movement activity such as Tai Chi. Any activity that requires weight bearing and challenges the postural system can

Table 7–7. Weight-Bearing Exercise for Adults

| |
|---|
| <p style="text-align: center;">Weight-Bearing/High Impact/ Resistance Activities:</p> |
| <ul style="list-style-type: none"> • Stair-climbing • Hiking • Dancing • Jogging • Downhill and cross-country skiing • Aerobic dancing • Volleyball • Basketball • Gymnastics • Weight lifting or resistance training • Soccer • Jumping rope |
| <p style="text-align: center;">Weight-Bearing/Low Impact Activities:</p> |
| <ul style="list-style-type: none"> • Walking • Treadmill walking • Cross-country ski machines • Stair-step machines • Rowing machines • Water aerobics • Deep-water walking • Low impact aerobics |
| <p style="text-align: center;">Non-Weight-Bearing/ Non-Impact Activities:</p> |
| <ul style="list-style-type: none"> • Lap swimming • Indoor cycling • Stretching or flexibility exercises (avoid forward-bending exercises) • Yoga • Pilates |

Source: NOF 2003.

- improve balance and potentially help reduce falls.
- Physical activity must be performed on average 3 times per week for 30–45 minutes per session for at least three months for strength and balance benefits to be realized, and it must be continued if benefits are to be maintained.

Figure 7–4. Resources for Strength Training for Older Adults

"You don't stop exercising because you grow old. You grow old because you stop exercising."
—Anonymous

Growing Stronger:

Strength Training for Older Adults

This strength-training program was developed by experts at Tufts University and the Centers for Disease Control and Prevention (CDC). It is based upon sound scientific research involving strengthening exercises—exercises that have been shown to increase the strength of your muscles, maintain the integrity of your bones, and improve your balance, coordination, and mobility. The CDC website features links to the book and animated illustrations of exercises.

Source: CDC 2004.

Exercise: A Guide From the National Institute on Aging

The 48-minute video and 80-page companion booklet were produced by the National Institute on Aging (NIA) to demonstrate how to start and stick with a safe, effective program of stretching, balance, and strength-training exercises. The video features Margaret Richard, star of *Body Electric*, PBS' popular exercise show.

Source: NIA 2004.

Boning Up on Osteoporosis: A Guide to Prevention and Treatment

This 70-page booklet provides information on the prevention, detection, and treatment of osteoporosis. The booklet includes tips on how to begin an exercise program and provides 17 pages of illustrations and instructions on moving safely.

Source: NOF 2003.

- Those who suffer a fall that requires a visit to a health care provider or an emergency room should ask for a fall risk assessment that includes a program of physical activity. Physical activity is most effective if delivered as a part of a comprehensive fall prevention program (see Chapter 6).

Physical Activity for Those With Fragility Fractures

Individuals who have already experienced osteoporotic fractures should avoid certain types of physical activities and exercises. For example, those who have had vertebral fractures may need to avoid activities that flex the spine. For more information about appropriate physical activity after osteoporotic fracture, see Chapter 9, “Rehabilitation of Osteoporotic Fractures.”

Fall Prevention

It is no surprise that falls are often the “precipitating” event that leads to a fracture in individuals with low bone mineral density (BMD), and that therefore preventing these falls can reduce the risk of fracture. Falls are a major contributor to hip fractures and are also associated with a significantly increased risk of many other fractures, including spine, wrist, pelvis, and upper arm. Since falls are usually caused by multiple factors, successful prevention strategies should involve multiple components. The benefit of physical activity in reducing the risk of falls was discussed in the previous section. There is more that can be done to reduce the chances of a fall and to minimize the impact of any fall that does occur. Guidelines issued by the American Geriatrics Society, British Geriatrics Society, and American Academy of Orthopedic Surgeons panel on falls prevention include the following recommendations for older persons (AGS et al. 2001):

- Inform health care providers about any fall, even those that do not result in serious injury. Providers should ask their older patients at least once a year about falls.
- Those who have fallen one or more times should ask their health care providers about the need for a test of their balance and ability to walk.

- Those who need medical attention after a fall or who have fallen several times in the past year should have a fall evaluation. This evaluation should include taking a history related to the circumstances of the fall and performing an examination of vision, balance, walking, muscle strength, heart function, and blood pressure. A specialist, such as a geriatrician, may be needed for this evaluation.
- Health care providers should consider prescribing a program of physical activity and balance training, with an emphasis on those activities that may help reduce risk of falling. Patients can also seek these programs on their own.
- Patients should ask their health care providers to review any medications they are taking (including over-the-counter ones) at least once per year. This step can help to avoid various medication-related problems that commonly lead to falls, such as drug-drug interactions and unnecessarily high doses of certain drugs.
- Vision should be checked annually.
- Individuals should review their homes for possible hazards that could cause a fall, such as loose rugs, poor lighting, electrical cords, or lack of handrails in the tub/shower.
- Individuals should be careful when using step ladders, making sure to use ladders that are stable and have a handrail.

Finally, as discussed in Chapter 6, use of hip protectors or hip pads may help reduce the risk of fractures for persons living in institutionalized care settings.

A good source for tips on how to prevent falls is “The Tool Kit to Prevent Senior Falls,” developed by the Injury Center at the Centers for Disease Control and Prevention (CDC). This

Table 7–8. Preventing Falls Among Seniors

| Tips |
|---|
| <p>Falls are not just the result of getting older. Many falls can be prevented. Falls are usually caused by a number of things. By changing some of these things, you can lower your chances of falling.</p> <p>You can reduce your chances of falling by doing these things :</p> |
| 1. Begin a regular exercise program. |
| <p>Exercise is one of the most important ways to reduce your chances of falling. It makes you stronger and helps you feel better. Exercises that improve balance and coordination (like Tai Chi) are the most helpful. Lack of exercise leads to weakness and increases your chances of falling. Ask your doctor or health care worker about the best type of exercise program for you.</p> |
| 2. Make your home safer. |
| <p>About half of all falls happen at home. To make your home safer:</p> <ul style="list-style-type: none"> • Remove things you can trip over (such as papers, books, clothes, and shoes) from stairs and places where you walk. • Remove small throw rugs or use double-sided tape to keep the rugs from slipping. • Keep items you use often in cabinets you can reach easily without using a step stool. • Have grab bars put in next to your toilet and in the tub or shower. • Use non-slip mats in the bathtub and on shower floors. • Improve the lighting in your home. As you get older, you need brighter lights to see well. Lamp shades or frosted bulbs can reduce glare. • Have handrails and lights put in on all staircases. • Wear shoes that give good support and have thin non-slip soles. Avoid wearing slippers and athletic shoes with deep treads. |
| 3. Have your health care provider review your medicines. |
| <p>Have your doctor or pharmacist look at all the medicines you take (including ones that don't need prescriptions such as cold medicines). As you get older, the way some medicines work in your body can change. Some medicines, or combinations of medicines, can make you drowsy or light-headed which can lead to a fall.</p> |
| 4. Have your vision checked. |
| <p>Have your eyes checked by an eye doctor. You may be wearing the wrong glasses or have a condition such as glaucoma or cataracts that limits your vision. Poor vision can increase your chances of falling.</p> |

Source: CDC 2004.

kit contains “What You Can Do to Prevent Falls,” an informational brochure, and “Check for Safety,” a home safety checklist designed to help older adults and caregivers identify and correct home hazards. It also contains four fact sheets and other relevant materials, and is available at <http://www.cdc.gov/injury>.

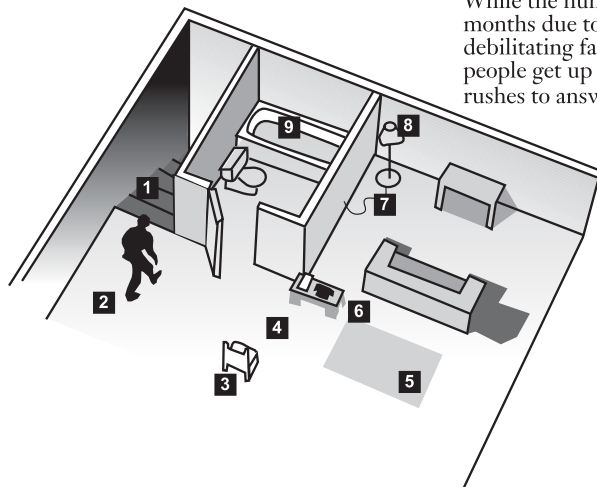
Other Aspects of a Bone-Healthy Lifestyle

In addition to having a healthy diet, sufficient physical activity, and avoiding falls, there are some other bone-healthy behaviors that can help protect the skeleton throughout life:

- Maintain a healthy body weight.
- Avoid smoking.
- If one drinks alcoholic beverages, do so in moderation (i.e., one drink per day for women and two drinks per day for men).
- For women, see a health care provider if menstrual periods stop for three months.
- For those who have a medical condition or who use medications that can affect the skeleton (listed in Tables 3-1 and 3-2 in Chapter 3), talk to a health care provider about ways to safeguard the skeleton.

Figure 7–5. Fall Risks to Elderly in the Home

While the number of falls increases during the winter months due to ice, snow, and shorter days, most debilitating falls happen indoors, often at night as people get up to use the bathroom, or when someone rushes to answer a telephone.



Here are the biggest culprits:

- 1** Cellar stairs, particularly those with no handrails
- 2** Slippers or shoes that do not provide good traction with rubberized soles or pads
- 3** Chairs that people stand on to change a light bulb or reach an object
- 4** Ill-placed furniture that obstructs a path to the bathroom
- 5** Throw rugs, or even larger rugs, on a hardwood floor that slip as someone walks on them
- 6** Narrow passages that require twists or contortions
- 7** Obstacles such as a book, glass, glasses or cord in a path
- 8** Dim or insufficient lighting
- 9** Shower and tub stalls that do not have slip proof strips

Source: Anderson 2004.

Summary

Following the suggestions outlined in this chapter on diet, physical activity, and other lifestyle behaviors can help ensure good skeletal health throughout life. For more specific information on how to adopt a bone-healthy lifestyle, see the resources listed in Appendix C. It is never too late for individuals, even frail elders, to start following a bone-healthy lifestyle.

Key Questions for Future Research

Research questions related to lifestyle approaches that promote bone health are included in the questions identified in Chapter 6 on page 141.

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